GENERAL AQUATIC WILDLIFE SYSTEM
(GAWS)

Interim Guidelines
1976

U.S. Forest Service
Intermountain Region
Wildlife Management
324 25th Street
Ogden, Utah 84401

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ROCKY MT. FOREST & RANGE
EXPERIMENT STATION

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THE GENERAL AQUATIC WILDLIFE SYSTEM
(GAWS)

Donald K. Dunham
Regional Aquatic Ecologist
Wildlife Management
Regional Office
Ogden, Utah

The General Aquatic Wildlife System is wildlife management resource information system for the Intermountain Region. The system provides guidelines for analysis of: (1) abiotic parameters including discharge, water storage, water chemistry, and other physical parameters, and (2) biotic parameters including fish, macroinvertebrates, aquatic plants and riparian plants. Elements of the system are:

- Stream analysis
- Lake-reservoir-pothole analysis
- Macroinvertebrate analysis
- Stratification criteria
- Data management programs
- Stream and lake catalog and systematic numbering for surface waters
- Forest Service maps and aerial photos
- Action Plans - Management by Objective

All elements are used to emphasize the habitat resource, and the program has computer capability with all forms developed to input-output formats. The computer will provide us with analysis output and display of habitat typing and ratings, habitat component analysis, diversity ratings, and instream flow programs as well as statistical measures, summation programs, and data inventory program.

These analyses will provide a basis for assessment of present conditions which will give managers direction in planning for improvement and maintenance of aquatic resources.

Example of rating scores for stream habitat components from 94 cluster sample stations from streams throughout the Intermountain Region (Chosen at random for this tabulation):

Rating Percent Class	Pool Measure	Pool Structure	Stream-bottom	Stream-banks	Habitat Percent of Optimum	Streambank Stability
0	7	31				6
1's	2	5	4			2
10's	8	17	5			4
20's	10	15	9	3	5	4
30's	15	5	6	9	24	2
40's	16	6	6	6	34	5
50's	7	3	11	16	15	3
60's	7	3	16	19	8	2
70's	5	2	13	31	6	3
80's	8	5	17	3	2	4
90's	7	2	7	6		5
100	2			1		12
TOTAL	94	94	94	94	94	58

(Continued on back)

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EXPERIMENT STATION

Sport fishing represents the major recreation value of many western waters - particularly the smaller ones. The ability of any water to produce fish and thus provide a fishing opportunity is strongly related to the condition of the fish habitat. In spite of their obvious importance, habitat conditions remain unknown. This lack of knowledge is partly due to the difficulty of determining which element of the habitat may be limiting and partly due to the expense of collecting habitat information.

Fish population survey work has been conducted on many waters of the United States. Geographic ranges of fish species are fairly well known or at least predictable, and management programs to perpetuate and enhance these resources are in effect.

Less well known with any precision and accuracy is the habitat resource available to, utilized, or occupied by these fish. The cause and effect relationship of man's activities which directly or indirectly affect the characteristics of the habitat is poorly understood. To improve our understanding of the aquatic resource, and as a means to avoid the subjective ocular or eyeball appraisals, a method for sampling general fish habitat characteristics of streams was investigated beginning in 1960 by the U. S. Forest Service and reported for use in 1967 by Herrington and Dunham. Since 1960, the basic method, that later became known as the transect method, has been tested and expanded into systems that have been applied to instream flow needs, baseline inventory, project work, land use planning, and lake-reservoir-potholes analysis. The systems do not singularly measure biomass and fish production, but are designed to inventory and display fish habitat characteristics at different intensities in order to fit the needs and purposes of a given level of planning.

FOREWORD
1976

The computer, with its automatic data processing capability has provided expanded dimensions to data management for the user. This program, GAWS, is an initial program effort with interim guidelines to explore the computer capability to serve aquatic wildlife resource programs. The fishery biologist and Forest Service line officers will benefit from information and data output programs carefully structured to meet needs for resource management.

After one year of field testing and output program development, GAWS will be appraised to determine effectiveness in meeting the several program areas in information management (INFORM) and functional needs.

GENERAL AQUATIC WILDLIFE SYSTEM
(GAWS)
U.S. Forest Service
Intermountain Region
Ogden, Utah

June 8, 1976

DESCRIPTION

The general aquatic wildlife system is a portion of Wildlife Management's information system for the Intermountain Region. It is designed to provide information from those data elements that should logically be handled by CS. Data which is to collected through Wildlife Management functional channels is that needed by Forest Service officials to fulfill the Chief's objectives and goals and at the same time provide aquatic wildlife data and information needed by other interested functions.

The following sections discuss description of the system, data input elements, and computer output programs. They also include a description of collection procedures, forms, and a listing of reference documents.

The general aquatic wildlife system is designed to serve the dual purposes of storage-retrieval without additional data manipulation and storage-retrieval with data manipulation through output programs which compute habitat ratings, streamflows, statistical measures, and standard descriptive features.

Initially, the data will be entered and stored at Ogden on magnetic tape. Completed input documents should be forwarded to Administrative Services Data Processing Center for handling. In a similar manner, computer outputs will be requested through Ogden. Costs of data processing will be the responsibility of each unit.

Essential features of the system are identification and field forms for streams and lakes, reference maps or aerial photos, and a stream and lake catalog.

Several terms are recurrently used as part of, in the description of, or related to, general aquatic wildlife system resource data elements.

Please refer to Glossary of Aquatic Ecological Terms and Nomenclature for Instream Assessment for definitions and commonly accepted usage of terms (see reference). Additional terms are:

Term	Definition
Cataract	Turbulent, broken surface flow of water over a steeply inclined streambed usually composed of bedrock.
Dead water	Standing water in streams which has little or no perceptible movement over a reasonable time period.

Term	Definition
Deep fast	A condition of water flow in streams greater than a specified depth and velocity (i.e., 1 foot of depth in excess of 3.0 cfs velocity).
Flat water	Water of low gradient usually without surface turbulence.
Glide	A calm stretch of water flowing smoothly and gently.
Inbeddedness	A scale measurement of the percentage degree to which the largest sized bottom elements of a stream segment are surrounded and partially covered by smaller sized particles.
Pool	Areas of stream with reduced velocity. Pools are judged on their size and cover features.
Riffle	Shallower section of stream with turbulent flows and/or swift velocities.
Ripple	Slower moving water exhibiting minor surface agitation or waves as a result of wind or velocity action.
Runs	A stretch of relatively deep, fast, flowing water with the surface essentially nonturbulent.
Slow shallow	Water in stream courses of little depth with very slow velocity.

DATA INPUTS

Data Sources and Inputs - Aquatic wildlife data input will primarily be from data recorded on identification and field forms. Output programs such as instream flow calculations and habitat ratings will be considered.

The five input document forms are not intended to record all aquatic wildlife management data needed by the Region, Forests, or Districts. Additional important resource data are available at offices of State resource agencies, other Federal agencies, and companion functional divisions within the Forest Service. These data sources are appropriately referenced on input forms.

The system is designed to provide for entering additional data elements and their interpretative values as needed by the Region, Forest, and Districts. After the initial entry of data is recorded on these input

forms and the system becomes operational, provisions will be made for editing and adding data elements individual Forests or Districts require for their specific management needs.

Certain elements must be collected and recorded to permit the system to work. Any number assigned by a State fish and game agency must be referenced, the Forest code entered, an Intermountain Region catalog number assigned, and the PWI (project watershed number) 5th code watershed number recorded. The catalog number may be determined by following the method described for streams in the Stream Catalog for the Intermountain Region, and for lakes in the instructions for completing lake identification form. Catalog numbers will be recorded on Forest maps or aerial photographs which will be considered as a part of this system.

Methods - Parts of the general aquatic wildlife system are already available. A description of field inventory procedure applicable to stream station form and instream data form is contained in "The Transect Method of Stream Habitat Inventory, Guidelines and Applications," by Donald K. Dunham and Albert Collotzi, August 1975. This same report illustrates output application to habitat ratings, instream flow needs, and inventory stratifications. Facts about habitat conditions and proposed direct habitat improvements can be got from data manipulation by designed output programs. Cross reference to programs of water quality and macroinvertebrate species diversity is noted (Chrostowski).

Entering Data - Enter accurate and reliable data. If data is unknown or questionable, leave blank unless specific instructions or project work requires entry of best estimate.

The initial supply of input forms is designed for entering data into the computer via keypunch. The notation card code, if followed by a number or numbers, is a reference for the keypunch operator. Field personnel should complete the input documents in pencil or pen with legible entry notations which make it easy for the keypunch operator to spot entries.

Specific Instructions - The description of each data item which appears in the following sections includes the following:

1. Each item is numbered in the same sequence as the data elements appear on the form.

2. The data name as it will appear on computer printouts.

3. Whether the entries must be alpha, numeric, or alpha-numeric.

4. A brief description of what is to be entered.

5. Whether entry begins from left side.

6. All spaces not otherwise recorded shall be left blank.

7. Code listing where entry is to be coded.

8. Stream resource data elements recorded as left or right are determined facing downstream.

General Aquatic Wildlife System (GAWS) Resource Data

Coding Instructions for Stream Identification Form, WL-2600-23(5/76) - (Exhibit 1)

The Stream Identification Form has been designed for identification of general data for a particular stream. When a stream crosses from one State to another, this form should be completed for each State. The form will contain data only for that portion of the stream within that State. Data on this form can be completed in the office.

General information at the top of the form (Investigator, Date, Forest, and Stream) is to assist in the handling of the form and will not be recorded in the computer.

WL-2600-23(5/76) - (Exhibit 1)

Entries

1. State - Record appropriate code for State in which stream is located.

2. Forest - Enter assigned administrative National Forest number in which stream is located.

3. Catalog Number - Record stream catalog number as described in the "Stream Catalog for the Intermountain Region." Place the catalog number to the far left and leave the remaining spaces blank.

4. Name of Stream - Enter the stream name if available. If the name exceeds 30 characters, abbreviate.

5. Stream Order - Stream order describes the branching pattern of river systems. Example: The smallest unbranched tributary is assigned No. 1, or called first order. When two first order streams join, the stream from that point downstream becomes a second order stream. Likewise, the function or confluence of two second order streams marks the beginning of third order streams, etc. A first order stream is generally defined as a perennial stream of sufficient size to appear on a 1/2" scale forest base map.

6. Location - Enter the latitude and longitude of the mouth of the stream, or where the stream leaves the Forest if the mouth is not located with the Forest boundary. Record to the nearest minute.

7. Total Length - Enter the total length of the stream within the Forest boundary. Record to the nearest 1/10 kilometer as xxxx.x. If total length exceeds 10,000 kilometers, record 9999.9.

EXHIBIT 1
STREAM AQUATIC HABITAT INVENTORY
STREAM IDENTIFICATION

Investigator_____ Date_____

Forest_____ Stream_____

CARD CODE (1-2) 0 1 1. STATE (3-4) _ _ 2. FOREST (5-6) _ _

0 6 California	0 1 Ashley	0 7 Dixie	1 3 Salmon
1 6 Idaho	0 2 Boise	0 8 Fishlake	1 4 Sawtooth
3 2 Nevada	0 3 Bridger-Teton	0 9 Humboldt	1 5 Targhee
4 9 Utah	0 5 Caribou	1 0 Manti-LaSal	1 7 Toiyabe
5 6 Wyoming	0 6 Challis	1 2 Payette	1 8 Uinta
			1 9 Wasatch

3. CATALOG NO. (7-29) _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _

4. NAME (30-59) _

5. STREAM ORDER (60-61) _ _

6. LOCATION - Longitude (62-66) _ _ _ Degrees, _ _ Minutes

Latitude (67-70) _ _ Degrees, _ _ Minutes

7. TOTAL LENGTH (71-75) _ _ _ _._ Kilometers

REMARKS:

Coding Instructions for Stream Station Form, WL-2600-24(5/76) - (Exhibits 2, 3, and 4)

The Stream Station Form is on three pages and will be used primarily in the field. Page 1 (exhibit 2) has to do with data on observations that can be completed in the office. Page 2 (exhibit 3) is used for measurements or observations that are made only once at each station. Page 3 (exhibit 4) is used for each of the five transect lines to be measured at the station. The latter two forms will be back-to-back on the same sheet of paper.

General information at the top of the form (Investigator, Date, Forest, and Stream) is to assist in the handling of the form and will not be recorded in the computer.

WL-2600-24(5/76) Page 1 (Exhibit 2)

Entries

1. State - Record appropriate code for State in which stream is located.

2. Forest - Enter assigned administrative National Forest number in which stream is located.

3. Catalog Number - Record stream catalog number as described in the "Stream Catalog for the Intermountain Region." Place the catalog number to the far left and leave the remaining spaces blank.

4. Station Number - Enter station number at left of decimal point. The right space is reserved for nine more stations between each regular station. This allows for greater detailed analysis at the project level. These extra stations would be recorded as 09.1, 09.2, etc. This will require preplanning for every stream prior to sampling.

5. Sample Number - The first time a station is sampled, the sample number would be 01, the next time 02, etc.

6. Watershed Code - Record fifth code as listed in the Forest Service Manual, R-4 supplement No. 11 under 2573.5.

7. Endangered-Threatened Species - Record a number for the specific classification and up to two letters for species present.

Specific Classification
Federal
1 - Endangered
2 - Rare
State
3 - Rare
4 - Peripheral
5 - Endangered
6 - Status Undetermined
Other
7 - Unique

Species
A - Snake River Cutthroat
B - Colorado River Cutthroat
C - Kendall Warmspring Dace
D -
E -
F -

8. State Stream Classification - Most States have given fishery streams a classification based upon the productivity of the stream along with other items such as access and esthetics. If the classification is available, record it in this space.

9. Fishery - Starting from the left, record the most dominant or important fish species, using the corresponding number. Up to five species can be listed.

01 = Rainbow
02 = Brown
03 = Cutthroat
04 = Brook
05 = Mackinaw
06 = Kokanee
07 = Channel Catfish
08 = Black Bullhead
09 = Yellow Bullhead
10 = Golden Trout
11 = Bonneville Cisco
12 = Mountain Whitefish
13 = Arctic Grayling
14 = Carp
15 = Utah Chub
16 = Colorado Chub (Bonytail)
17 = Leatherside Chub
18 = Redside Shiner
19 = Colorado Squawfish
20 = Least Chub
21 = Speckled Dace
22 = Longnose Dace
23 = Fathead Minnow
24 = Virgin River Spinedace
25 = Woundfin
26 = Utah Sucker
27 = Flannelmouth Sucker
28 = Mt. Sucker
29 = Bluehead Sucker
30 = Green Sucker
31 = Humpback Sucker
32 = Plains Killifish
33 = Rainwater Killifish
34 = Mosquitofish
35 = White Bass
36 = Largemouth Bass
37 = Smallmouth Bass
38 = Green Sunfish
39 = Bluegill Sunfish
40 = Black Crappie
41 = Yellow Perch
42 = Walleye
43 = Mottled Sculpin
44 = White Crappie
45 = Threadfin Shad
46 = Golden Shiner
47 = Bear Lake Whitefish
48 = Bonneville Whitefish
49 = Sacramento Perch
50 = Northern Pike

10. Geologic Classification - The data for this space is available from the soil scientist, geologist, or a good geology map, and can be

entered later in the office after the field work is completed. The classification is based on the geologic material above the sample point. In order to use this system, you will need to understand the following definitions:

Granite: Includes all pre-Cambrian rocks - chiefly granite, but also includes metasedimentary rocks (gneiss & schist). Produces coarse sediments.

Hard Sedimentary: Paleozoic rocks. Well consolidated, contains high proportion of hard sandstone, limestone, and dolomite. Not high sediment producers.

Soft Sedimentary: Mesozoic and Cenozoic rocks. Poorly consolidated, high frequency of mass movement. Contains many soft plastic shales. High sediment producers - much suspended sediment.

Flows: (Basalt-rhyolite, etc.) Fine grained igneous rocks occurring in large sheets.

Select the category which best fits the situation and place the letter in the space.

Primary	Dominant Secondary
A-Granite 100%	None (may allow 10% inclusions)
B-Granite >50%	Hard Sedimentary <50%
C-Granite >50%	Soft Sedimentary <50%
D-Granite >50%	Flows (lava, rhyolite, etc.) <50%

Primary	Dominant Secondary
E-Hard Sedimentary 100%	None (10% inclusions OK)
F-Hard Sedimentary >50%	Granite <50%
G-Hard Sedimentary >50%	Soft Sedimentary <50%
H-Hard Sedimentary >50%	Flows <50%
I-Soft Sedimentary 100%	None (10% inclusions OK)
J-Soft Sedimentary >50%	Granite <50%
K-Soft Sedimentary >50%	Hard Sedimentary <50%
L-Soft Sedimentary >50%	Flows <50%

Primary	Secondary
M-Flows 100%	None (10% inclusions OK)
N-Flows >50%	Granite <50%
O-Flows >50%	Hard Sedimentary <50%
P-Flows >50%	Soft Sedimentary <50%

11. Instream Data Available - If the instream data has been collected and filed, or collected and computed and then filed on the Forest, mark "yes." If there has not been data collected, mark "no." This will document whether or not the data is available.

12. Water Quality Data Available in STORET - Mark a "yes" or "no" as in item 11. This will document whether or not the data is available.

13. Macroinvertebrate Data Available - Mark a "yes" or "no" as in items 11 and 12. This data will be kept in a separate computer program.

EXHIBIT 2
STREAM AQUATIC HABITAT INVENTORY
STREAM STATION FORM - Page 1

Investigator_____ Date_____

Forest_____ Stream_____

CARD CODE (1-2) 0 2 1. STATE (3-4) _ _ 2. FOREST (5-6) _ _

3. CATALOG NO. (7-29) _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _

4. STATION NO. (30-32) _ _._ 5. SAMPLE NO. (33-34) _ _

6. WATERSHED CODE (35-38) _ _ _ _

7. ENDANGERED - THREATENED SPECIES:

Classification (39) _

Species (40-41) _ _ (Record up to 2 codes)

8. STATE STREAM CLASSIFICATION (42) _

9. FISHERY (43-52) _ _, _ _, _ _, _ _, _ _ (Record up to 5 codes)

10. GEOLOGICAL CLASSIFICATION (53) _

11. INSTREAM DATA AVAILABLE - Y-Yes (54) _, N-No (55) _

12. WATER QUALITY DATA AVAILABLE IN STORET - Y-Yes (56) _, N-No (57) _

13. MACROINVERTEBRATE DATA AVAILABLE - Y-Yes (58) _, N-No (59) _

Page 2 (Exhibit 3)

Entries

1. State - Record appropriate code for State in which stream is located.

2. Forest - Enter assigned administrative National Forest number in which stream is located.

3. Catalog Number - Record stream catalog number as described in the "Stream Catalog for the Intermountain Region." Place the catalog number to the far left and leave the remaining spaces blank.

4. Station Number - Enter station number at left of decimal point. The right space is reserved for nine more stations between each regular station. This allows for greater detailed analysis at the project level. These extra stations would be recorded as 09.1, 09.2, etc. This will require preplanning for every stream prior to sampling.

5. Sample Number - The first time a station is sampled, the sample number would be 01, the next time 02, etc.

6. Date of Sample - Enter month and year of sample as MM/YY. January 1976 would be recorded as 01/76.

7. Elevation - Can be taken from a topographic map or measured with a pocket altimeter. Record to nearest 1/10 of a meter. Example: 247 1/3 meters is recorded as 247.3 meters and 247 2/3 meters is recorded as 247.7 meters.

8. Location - Enter the latitude and longitude as close as possible for each station. Record to the nearest minute.

9. Velocity - Enter the velocity either as estimated or metered. Record to the nearest 1/10 meter per second.

10. Volume - Record to nearest cubic meter per second.

11. Gradient - Record gradient to the nearest 1/2 percent.

12. Valley Bottom Width - The valley bottom is described as that area of land that has been formed as a result of water-related processes, glacial activity, and may be influenced by the present stream. In many cases, it will be from toe slope to toe slope. The measurement is to be made to the nearest meter, excluding the channel width.

13. Geology Landform - While at the station, try to determine the geology landform as described. If this becomes difficult, record comments and discuss with a soil scientist or geologist upon returning from the field. Select the process which best describes the situation and enter the appropriate number.

14. Access - Enter the appropriate number.

15. Beaver - Enter the appropriate number.

EXHIBIT 3
STREAM AQUATIC HABITAT INVENTORY
STREAM STATION FORM - Page 2

Investigator_____ _____ Date_____

Forest_____ Stream_____

Photo No._____

CARD CODE (1-2) 0 3 1. STATE (3-4) _ _ 2. FOREST (5-6) _ _

3. CATALOG NO. (7-29) _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _

4. STATION NO. (30-32) _ _._ 5. SAMPLE NO. (33-34) _ _

6. DATE (35-38) MM/YY _ _/_ _ 7. ELEVATION (39-43) _ _ _ _ _Meters

8. LOCATION - Longitude (44-48) _ _ _° _ _' Latitude (49-52) _ _° _ _'

9. VELOCITY (Meters/Second) - Estimated (53-54) _ _, Metered (55-56) _ _

10. VOLUME (57-61) _ _ _ _ _CMS 11. GRADIENT (62-64) _ _._

12. VALLEY BOTTOM WIDTH (65-69) _ _ _ _ _Meters

13. GEOLOGICAL LANDFORM (70) _

Landform	Valley Bottom Material
1 U-shaped Valley	Moraine
2 U-shaped Valley	Alluvium
3 U-shaped Valley	Bedrock
4 V-shaped & Open Valley	Moraine
5 V-shaped & Open Valley	Alluvium
6 V-shaped & Open Valley	Bedrock
7 Planar Landform	Moraine
8 Planar Landform	Alluvium
9 Planar Landform	Bedrock

14. ACCESS (71) _

1 Access is satisfactory for modern car

2 Access is appropriate for pickup

3 Access is appropriate for 4-wheel drive

4 Access trail for horse or foot travel

5 No trail to area

15. BEAVER (72) _

1 Active beaver dam

2 Inactive beaver dam in good repair

3 Inactive beaver dam in poor repair

4 Evidence of old beaver dam but little effect on stream

5 No beaver activity evident

Page 3 (Exhibit 4)

This page is located on the back side of page 2. The section has to do with measurements that are repeated for all five transects. Each transect includes two (2) cards such as 4 and 5, or 6 and 7, etc. The section is divided only for fitting on the page. Data will be recorded in coded form for meaningful analysis by the computer for such variables as pool location and features, environment and stability, etc. Although these variables are listed in this write-up, they are also listed on page 3 for use in the field.

Entries

Items 1, 2, 3, 4, and 5 (State, Forest, Catalog Number, Station Number, and Sample Number) occupy the first 34 spaces of every card, but are not recorded by the user on this page. They will be carried forward by the keypuncher.

6. Channel Width - The width between the high water marks or bank full capacity when high water marks are not discernible. Record measurements to the nearest 1/3 or 1/10 meter. Example: 25 1/3 meters is recorded as 25.3 meters and 25 2/3 meters is recorded as 25.7 meters.

7. Water Width - Record the width of the water surface at the time of survey in meters as described in item 6.

8. Average Depth - Record to the nearest centimeter. Measure depth at intervals of one-fourth, one-half, and three-fourths the distance across the water width. The depth readings are averaged by addition and division by 4 which gives weight to zero depths at bank points.

9. Riffle Width - Enter the difference between water width and the sum of all pool widths in meters as described in item 6.

10. Pool Width - The page allows for up to three pools per transect. Record the width of the pool along the transect in meters as described in item 6.

11. Pool Rating - Select the pool rating which best describes the pool and record. The pool ratings are on the field form (Exhibit 4) for use in the field.

12. Location - The pool is recorded as in contact with the right or left bank, or as center if not bank associated. R - right bank, C - center if not bank associated, L - left bank.

13. Feature - Record up to four features of pool cover. These features are:

1 - boulder	5 - log jam
2 - overhanging bank	6 - beaver dam
3 - water depth	7 - rock outcrop
4 - vegetation or tree roots	8 - other

14. Aquatic Plants - Record measurements of rooted aquatic vegetation occurring along the transect in meters as described in item 6.

15. Stream Bottom - Types of bottom material are defined below. Each should be recorded in meters as described in item 6.

Boulders (B)	- rocks over 12 inches in diameter.
Rubble (R)1/	- rocks 3 inches to 12 inches in diameter.
Gravel (G)2/	- rocks 1/8 inch to 2.9 inches inch in diameter.
Sand (S)	- very fine textured soil, less than 1/8 inch in diameter.
Silt (Si)	- very fine textured soil, less than 1/8 inch in diameter, and less granular than sand.
Other (O)	- other conditions not falling into the other four categories: i.e., a sunken log, decaying vegetable matter. Enter type number in column 68 as: 1. Bedrock 2. Sunken log 3. Decaying vegetable matter 4. Other

1/ Coarse rubble - 6-12 inches diameter
Fine rubble - 3-6 inches diameter

2/ Coarse gravel - 1-3 inches diameter
Fine gravel - 1/8-1 inch diameter

16. Bank Measurements - Record the number which best describes the situation. Environment is the class of vegetation precisely at and overhanging the transect points at waters edge. Bank stability is rated at each transect water width bank points. An unstable rating is given if there is any evidence of soil sloughing within the past year. On multiple channels, only the two outermost banks are rated.

Environment		Stability
1.	Forested	Stable
2.	Forested	Unstable
3.	Brush	Stable
4.	Brush	Unstable
5.	Sedge/grass	Stable
6.	Sedge/grass	Unstable
7.	Exposed solid rock or bare soil	Stable
8.	Exposed solid rock or bare soil	Unstable

	WATER SURFACE				POOLS											
					1				2				3			
CARD CODE	6 CHANNEL WIDTH	7 WATER WIDTH	8 AVERAGE DEPTH	9 RIFFLE WIDTH	10 POOL WIDTH	11 RATING	12 LOCATION	13 FEATURE	POOL WIDTH	RATING	LOCATION	FEATURE	POOL WIDTH	RATING	LOCATION	FEATURE
	3	39	42	45	48	51	52	53	57	60	61	62	66	69	70	71
	xx.x	xx.x	xxx	xx.x	xx.x	x	x	xxxx	xx.x	x	x	xxxx	xx.x	x	x	xxxx
04	_ _._	_ _._	_ _ _	_ _._	_ _._	_	_	_ _ _ _	_ _._	_	_	_ _ _ _	_ _._	_	_	_ _ _ _
06	_ _._	_ _._	_ _ _	_ _._	_ _._	_	_	_ _ _ _	_ _._	_	_	_ _ _ _	_ _ _	_	_	_ _ _ _
08	_ _._	_ _._	_ _ _	_ _._	_ _._	_	_	_ _ _ _	_ _._	_	_	_ _ _ _	_ _ _	_	_	_ _ _ _
10	_ _._	_ _._	_ _ _	_ _._	_ _._	_	_	_ _ _ _	_ _._	_	_	_ _ _ _	_ _ _	_	_	_ _ _ _
12	_ _._	_ _._	_ _ _	_ _._	_ _._	_	_	_ _ _ _	_ _._	_	_	_ _ _ _	_ _ _	_	_	_ _ _ _

Pool Location -
- R right bank
- L left bank
- C center if not bank asso.

Pool Feature -
- 1 boulder
- 2 overhanging bank
- 3 water depth
- 4 veg. or tree roots
- 5 log jam
- 6 beaver dam
- 7 rock outcrop
- 8 other

Type -
- 1 bedrock
- 2 sunken log
- 3 decaying vegetable matter
- 4 other

Bank Measurements
- 1 forested stable
- 2 forested unstable
- 3 brush stable
- 4 brush unstable
- 5 sedge/grass stable
- 6 sedge/grass unstable
- 7 exposed stable
- 8 exposed unstable

Pool rate	Pool length or width	Pool depth	Pool shelter*
1	Greater than ave. stream width	2/3 M or deeper	Abundant 1/
	Greater than ave. stream width	1 M or deeper	Exposed 2/
2	Greater than ave. stream width	2/3 M or deeper	Exposed
	Greater than ave. stream width	less than 2/3 M	Intermediate 3/
	Greater than ave. stream width	less than 2/3 M	Abundant
3	Equal to ave. stream width	less than 2/3 M	Intermediate
	Equal to ave. stream width	less than 2/3 M	Abundant
4	Equal to ave. stream width	shallow 4/	Exposed
	Less than ave. stream width	shallow	Abundant
	Less than ave. stream width	shallow	Intermediate
	Less than ave. stream width	less than 2/3 M	Intermediate
	Less than ave. stream width	2/3 M or deeper	Abundant
5	Less than ave. stream width	shallow	Exposed

* Shelter = logs, stumps, boulders in or overhanging pool. Dense beds of aquatic vegetation or overhanging banks.
1/ Abundant = More than 1/2 perimeter of pool has cover.
2/ Exposed = Exposed (little or no shelter or cover) less than 1/4 of pool perimeter has cover.
3/ Intermediate = 1/4 to 1/2 perimeter of pool has covet.
4/ Shallow = Approximately equal to average stream depth.

		STREAM BOTTOM 15						BANK 16 MEASURE	
CARD CODE	14 AQUATIC PLANTS	12+ BOULDER	3-12 RUBBLE	1/8-3 GRAVEL	SAND-SILT	TYPE	OTHER	L. B. ENVIR. STABILITY	R. B. ENVIR. STABILITY
	35	38	41	44	47	50	51	54	55
	xx.x	xx.x	xx.x	xx.x	xx.x	x	xx.x	x	x
5	_ _._	_ _._	_ _._	_ _._	_ _._	_	_ _._	_	_
7	_ _._	_ _._	_ _._	_ _._	_ _._	_	_ _._	_	_
9	_ _._	_ _._	_ _._	_ _._	_ _._	_	_ _._	_	_
11	_ _._	_ _._	_ _._	_ _._	_ _._	_	_ _._	_	_
13	_ _._	_ _._	_ _._	_ _._	_ _._	_	_ _._	_	_

Coding Instructions for Instream Flow Data, WL-2600-25(5/76) - Exhibit 5

This section has to do with additional measurements to determine instream flow requirements. Data will be collected at representative stations only. All measurements are to be made from the left bank to the right bank.

General information at the top of the form (Investigator, Date, Forest, and Stream) is to assist in the handling of the form and will not be recorded in the computer.

The form allows for 52 measurements; if additional measurements are needed, use additional sheets and renumber the code numbers on the second sheet. Example: card code #14 becomes 41, etc.

WL-2600-25(5/76) (Exhibit 5)

Entries

1. State - Record appropriate code for State in which stream is located.

2. Forest - Enter assigned administrative National Forest number in which stream is located.

3. Catalog Number - Record stream catalog number as described in the "Stream Catalog for the Intermountain Region." Place the catalog number to the far left and leave the remaining spaces blank.

4. Station Number - Enter station number at left of decimal point. The right space is reserved for nine more stations between each regular station. This allows for greater detailed analysis at the project level. These extra stations would be recorded as 09.1, 09.2, etc. This will require preplanning for every stream prior to sampling.

5. Sample Number - The first time a station is sampled, the sample number would be 01, the next time 02, etc.

6. Type of Meter - Record the type of meter used to determine flow measurements.

7. Distance Between Levels - The flow measured at the time of survey is the Index Flow. For information on habitat as a result of higher or lower flows, enter the distance desired between water levels.

8. Horizontal Distance - Record the distance between measurements along the tape to the nearest 1/10 meter.

9. Vertical Distance - Record the distance between the tape and the ground or water surface to the nearest centimeter.

10. Water Depth - Record the distance from the water surface to the stream bottom to the nearest centimeter.

11. Velocity - To make flow determinations, use the USGS methods. There will be times when the depth will be such that measurements will need to be made at 2/10 and and 8/10 of the total depth. When this happens, use the same number of seconds each time and then average the two counts for revolutions and enter that figure.

Time - Record the time in seconds.

Revolutions - Record the revolutions as determined.

Velocity - Record the velocity in meters per second if using a direct reading meter.

EXHIBIT 5
INSTREAM FLOW DATA
FLOW MEASUREMENT AND STREAM PROFILE

Date_____ Stream_____
Investigator_____ Forest_____

CARD CODE (1-2) 1 4 1. STATE (3-4) _ _ 2. FOREST (5-6) _ _
3. CATALOG NO. (7-29) _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _, _ _ _
4. STATION NO. (30-32) _ _._ 5. SAMPLE NO. (33-34) _ _
6. TYPE OF METER (35) _ (Standard=S or Pygmy=P)
7. DISTANCE BETWEEN LEVELS (36-37) _ _ centimeters

Horiz. Dist. 8 (meters)		Vert. Dist. 9 (meters)	Water Depth 10 (meters)	Velocity 11 Time (sec)	Rev.	Velocity m/s	Horiz. Dist.	Vert. Dist.	Water Depth	Velocity Time	Rev.	Velocity
1-2	38 x.x	40 x.x x	43 x.x x	46 x x	48 x x x	51 x.x x	54 x.x	56 x.x x	59 x.x x	62 x x	64 x x x	67 x.x x
15	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
16	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
17	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
18	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
19	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
20	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
21	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
22	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
23	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
24	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
25	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
26	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
27	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
28	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
29	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
30	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
31	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
32	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
33	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
34	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
35	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
36	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
37	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
38	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
39	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _
40	_._	_._ _	_._ _	_ _	_ _ _	_._ _	_._	_._ _	_._ _	_ _	_ _ _	_._ _

Coding Instructions for Lake-Reservoir-Pothole Habitat Inventory, Identification Form, WL-2600-26(5/76) - (Exhibit 6)

This form has been designed for identification of general data for a particular lake, reservoir, or pothole. Data on this form can be completed in the office.

General information at the top of the form (Investigator, Date, Forest, and Lake, Reservoir, or Pothole name or number) is to assist in the handling of the form and will not be recorded in the computer.

WL-2600-26(5/76) (Exhibit 6)

Entries

1. State - Enter code for State in which lake/reservoir occurs.

2. Forest - Enter Forest code.

3. Catalog Number - Enter appropriate State code if available, or appropriate number assigned to lake.

4. Name of Lake - Enter official lake name from USGS quadrangle maps, if available.

5. Drainage - Enter name of drainage in which lake occurs, to be named by drainage that leaves Forest boundary.

6. Special Area - List code for special area if applicable. Special areas may be added to this code, but should be cleared at Regional Office level.

7. Location - Enter longitude in degrees and minutes of lake/reservoir location. Enter latitude in degrees and minutes of lake/reservoir location. Enter township in which lake/reservoir is located (e.g., 013N). Enter range in which lake/reservoir is located (e.g., 012E). Enter section in which lake/reservoir is located. If lake/reservoir crosses a section line, enter section which contains largest portion of lake/reservoir.

8. Total Surface Area - Enter total surface area (in hectares) of lake/reservoir when full. If less than 1 hectare, record in tenths.

9. Elevation - Enter surface elevation above sea level of lake/reservoir. This can usually be obtained using USGS contour quadrangle maps. Record to nearest 1/10 of a meter.

10. Photo Number - Enter appropriate aerial photograph number where lake/reservoir may be referenced.

EXHIBIT 6
LAKE-RESERVOIR-POTHOLE HABITAT INVENTORY
IDENTIFICATION FORM

Date_____ Lake, etc._____

Investigator_____ Forest_____

CARD CODE (1-2) 7 1

1. STATE (3-4) _ _
   - 06 California
   - 16 Idaho
   - 32 Nevada
   - 49 Utah
   - 56 Wyoming

2. Forest (5-6) _ _

01 Ashley	08 Fishlake	15 Targhee
02 Boise	09 Humboldt	17 Toiyabe
03 Bridger-Teton	10 Manti-LaSal	18 Uinta
05 Caribou	12 Payette	19 Wasatch
06 Challis	13 Salmon	
07 Dixie	14 Sawtooth	

3. CATALOG NO. (7-16) _ _ _ _ _ _ _ _ _ _

4. NAME OF LAKE (17-36) _

5. DRAINAGE (37-56) _

6. SPECIAL AREA (57-58) _ _

01 High Uintas Primitive Area	06 Jarbidge Wilderness
02 Idaho Primitive Area	07 Sawtooth Wilderness Area
03 Teton Wilderness	08
04 Bridger Wilderness	09
05	

CARD CODE (1-2) 7 2 (3-16) Duplicate

7. LOCATION: Longitude (17-21) _ _ _° _ _', Latitude (22-25) _ _° _ _'
   Township (26-29) _ _ _ _ Range (30-33) _ _ _ _
   Section (34-35) _ _

8. TOTAL SURFACE AREA (36-41) _ _ _ _ _._ Hectares

9. ELEVATION (42-46) _ _ _ _._ nearest 1/10 meter

10. PHOTO NUMBER (47-56) _ _ _ _ _ _ _ _ _ _

WL-2600-26(5/76)

Coding Instruction for Lake-Reservoir-Pothole Habitat Inventory, Field Survey, Form WL-2600-27(5/76) (Exhibit 7)

This form has been designed for use in the field. Data elements 1-3 and 33-35 may be completed in the office. Other elements are field investigation source data.

General information at the top of the form (Investigator, Date, Forest, and Lake, Reservoir, or Pothole name or number) is to assist in the handling of the form and will not be recorded in the computer.

WL-2600-27(5/76) (Exhibits 7 & 8)

Entries

1. State - Enter code for State in which lake/reservoir occurs.

2. Forest - Enter Forest code.

3. Catalog Number - Enter appropriate State code if available, or appropriate or approximate number assigned to lake. (This number should be same number as recorded on identification form.)

4. Land Type - Enter code of situation that was responsible for lake's/reservoir's formation.

5. Geologic Parent Material - Enter code of land formation that best describes geology of land surrounding and upstream from lake/reservoir.

6. Inlet Base Flow - Enter sum of inlet streams or seeps contributing to lake, recorded to nearest 1/10 cubic foot per second (e.g., _ _ _ 4.1) as measured or estimated at time of survey.

7. Spawning - Record, to nearest whole meter, the length(s) of inlet stream accessible to fish species being managed for.

8. Spawning Suitability - Enter code best describing suitability of inlet to provide spawning opportunities for dominant fish species present or species to be managed for.

9. Outlet Base Flow - Record, to nearest 1/10 meter, the outlet flow at the time of survey.

10. Spawning - Record, to the nearest whole meter, the length of outlet that is suitable for spawning, and which permits young fish to return to lake/reservoir.

11. Spawning Suitability - Enter code best describing suitability of outlet to provide spawning opportunities for fish species being managed for.

12. Water Depth - Enter code describing whether following depth data has been measured or estimated.

13. Depth Record - Record, to nearest 1/10 meter, the depths of the lake/reservoir at the time of survey, as measured or estimated along 10 equal distance points from north to south (or along the long axis if the lake/reservoir is very oblong).

14. Depth Record - Record, to the nearest 1/10 meter, the depths of the lake/reservoir at the time of the survey, as measured or estimated, along 10 equal distance points from east to west (or along the short axis if the lake/reservoir is very oblong).

15. Maximum Depth - Enter maximum depth of lake/reservoir as measured or estimated to the nearest 1/10 meter. If deeper than 99.9 meters, enter 99.9.

16. Average Depth - Enter average depth of lake/reservoir to nearest 1/10 meter. This may be obtained by averaging depth transects recorded above or by visually estimating.

17. Fluctuation - Enter height of probable maximum water fluctuation to the nearest 1/10 meter, as evidenced by drawdown at time of survey, or by drawdown lines indicated by such things as lack of aquatic vegetation or lighter colored substrate.

18. Shoal Composition - Record shoal composition (that area 5 meters of less) by percent of total shoal area in one or more of each of the categories. Sum of all components should equal but not exceed 100 percent. Record as whole percent, e.g., 0 7 3.

19. Shoal Area - Record percentage of lake/reservoir bottom that is 5 meters or less in depth.

20. Shoreline - Record percentage of shoreline components in the listed categories. Sum should equal, but not exceed, 100 percent. Include that area within 100 feet of lake/reservoir shoreline.

21. Shoreline Terrestrial Plants - Record one code that best describes shoreline terrestrial plants within 100 feet of lake/reservoir.

22. Chemical Analysis - Enter total alkalinity as whole miligrams per liter and indicate whether measured or estimated. Enter specific conductance (conductivity) expressed as whole micromhos per centimeter at 25°C and indicate whether measured (M) or estimated (E). Enter secchi disc reading to nearest 1/10 meter and indicate whether measured (M) or estimated (E). Enter total dissolved solids expressed as whole

miligrams per liter and indicate whether measured (M) or estimated (E). Enter pH expressed to nearest 1/10 of a unit and enter whether measured (M) or estimated (E). Enter surface water temperature expressed as °C to the nearest 1/10 degree and record whether measured (M) or estimated (E). Enter bottom water temperature expressed as °C to the nearest 1/10 degree and record whether measured (M) or estimated (E). Indicate whether other chemical/temperature is available or has been recorded by entering Y (yes) or N (no).

23. Aquatic Plants - Enter single code that best describes aquatic plant community observed (quanitative definitions to be written).

24. Aquatic Animals - List relative abundance (A,C,U,R) of aquatic organisms observed or collected opposite category of organisms. No limit to number of organism groups or abundance codes used, but use only one abundance code per group. (Quantitative definitions to be written.) Indicate whether other data is available or has been collected by entering Y (yes) or N (no).

25. Fish Species - List relative abundance (A,C,U,R) of fish species observed or known to exist. No limit to number of species or abundance codes used, but use only one abundance code per group (quantitative definitions to be written).

26. Fish Size - Enter longest total length observed, expressed as whole centimeters. Enter average total length of all fish observed, expressed as whole centimeters. Enter minimum total length of fish observed, expressed as whole centimeters.

27. Fish Condition - Enter condition of typical fish observed. Enter as E, G, F or P. (Quantitative definitions yet to be written.)

28. Natural Reproduction - Enter appropriate single code best expressing success of natural reproduction occurring in lake/reservoir.

29. Access - Enter appropriate single code best expressing availability of access to lake/reservoir.

30. Distance to Road - Record distance to the nearest public road, expressed as whole kilometers.

31. Recreational Suitability - Record area, expressed as whole hectares, suitable for recreational development such as camping, parking, or picnicking. Normally, these are dry areas, free of hazards, with slopes less than 8 percent and away from main trails.

32. Pack Stock Forage - Record area of forage available and suitable for pack stock use, expressed in whole hectares. Normally, these are open areas, free of bogs, further than 200 yards from campsites or lakeshores, and slopes less than 35 percent (special regulations may apply to specific areas).

33. Limiting Factors - List codes of limiting factors, selected in list below, that best describe factors limiting fishery value of the lake/reservoir. List maximum of 10 codes in order of importance.

34. Management Needs - List codes of fishery needs, selected from list below, that best describe management prescriptions that would improve fishery value of lake/reservoir. List no more than 10 needs in order of importance.

35. Date - Enter date survey was included as month (e.g., July = 0 7) and year (e.g., 1976 = 7 6).

36. Comments or Remarks - Record by entry of Y (yes) or N (no) whether additional comments are entered below. These comments will not be entered in the computer but can be referred to in the future review of the field form.

37. Investigators - List names.

EXHIBIT 7
LAKE-RESERVOIR-POTHOLE HABITAT INVENTORY
FIELD SURVEY FORM
Page 1 of 3

Date_____ Lake, etc._____

Investigator_____ Forest_____

CARD CODE (1-2) 7 3 1. STATE (3-4) _ _ 2. FOREST (5-6) _ _
3. CATALOG No. (7-16) _ _ _ _ _ _ _ _ _ _
4. LAND TYPE - Situation that created lake (17) _ 5. GEOLOGIC PARENT MATERIAL (18) _

1. Major cirque	6. Beaver dams	1. Granitic
2. Minor cirque	7. Natural supplemented by manmade structure	2. Quartzite
3. Moraine	8. Manmade dam or other structure	3. Sedimentary
4. Slump or slide	9. Other	4. Volcanic
5. Ice block molting		5. Metamorphic

6. INLET BASE FLOW (19-23) _ _ _ _._ (nearest 1/10 of c.f.s.)
7. LENGTH ACCESSIBLE FOR SPAWNING (24-28) _ _ _ _ _ meters
8. INLET SPAWNING SUITABILITY (29) _
   1. Excellent (abundant)
   2. Adequate (enough to maintain suitable lake population)
   3. Fair (not adequate to maintain population)
   4. Not suitable for successful spawning

9. OUTLET BASE FLOW (30-34) _ _ _ _._ (nearest 1/10 of c.f.s.)
10. LENGTH ACCESSIBLE FOR SPAWNING (35-39) _ _ _ _ _ meters
11. OUTLET SPAWNING SUITABILITY (40) _
   1. Excellent (abundant)
   2. Adequate (enough to maintain suitable lake population)
   3. Fair (not adequate to maintain population)
   4. Not suitable for successful spawning

12. WATER DEPTH DATA IS (41) _ M = Measured, E = Estimated
13. RECORD 10 DEPTHS ALONG TRANSECT LINES - nearest 1/10 meter (42-71)
   North -- _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, _ _._ -- South

CARD CODE (1-2) 7 4 Duplicate (3-16)
14. East -- _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, _ _._, -- West (17-46)
15. MAXIMUM WATER DEPTH (47-49) _ _._ (nearest 1/10 meter) 16. AVERAGE DEPTH (50-52) _ _._ (nearest 1/10 meter)
17. WATER FLUCTUATION (53-55) _ _._ (nearest 1/10 meter)
18. SHOAL COMPOSITION: Boulders (56-58) _ _ _%; Rubble/Gravel (59-61) _ _ _%; Soil Sand or Silt (62-64) _ _ _%; Marl (65-67) _ _ _%; Veg. or Debris (68-70) _ _ _%
19. SHOAL AREA - 5 meters or less (71-73) _ _ _%

CARD CODE (1-2) 7 5 Duplicate (3-16)
20. SHORELINE: Rock (17-19) _ _ _%; Soil (20-22) _ _ _%; Vegetation (23-25) _ _ _%
21. SHORELINE TERRESTRIAL PLANTS - Record Dominant Situation (26) _
   1. None or very sparce
   2. Plants present are dominantly grasses or sedges
   3. Plants present are dominantly shrubs
   4. Plants present are dominantly conifer trees
   5. Plants present are dominantly deciduous trees

22. CHEMICAL ANALYSIS - M = Measured, E = Estimated

		M or E
Alkalinity (27-30)	_ _ _ mg/l	_
Specific Conductance (31-35)	_ _ _ _ umho/cm2 at 25°C	_
Secchi Disc (36-39)	_ _._ meters	_
Total Dissolved Solids (40-43)	_ _ _ mg/l	_
PH (44-47)	_ _._	_
Temperature - Surface (48-51)	_ _._ °C	_
Bottom (52-55)	_ _._ °C	_

Is additional data available? (56) _ Y = Yes, N = No

EXHIBIT 8
Page 2 of 3

23. AQUATIC PLANTS - Record Dominant Situation (57) _

1. None except phytoplankton
2. Sparce filamentous algae
3. Abundant filamentous algae
4. Sparce floating forms (water or pond lillies, duckweed, etc.
5. Abundant floating forms
6. Sparce emergent forms (arrowhead, cattails, etc.)
7. Abundant emergent forms
8. Sparce submerged forms (potamogeton, milifoil, buttercup, etc.)
9. Abundant submerged forms

24. AQUATIC INVERTEBRATES AND VERTEBRATES OTHER THAN FISH:
Enter: A = Abundant, C = Common, U = Uncommon, R = Rare

Zooplankton (58)	_	Diptera (59)	_
Ephemeroptera (60)	_	Amphipoda (61)	_
Odonata (62)	_	Mollusca (63)	_
Plecoptera (64)	_	Frogs & Toads (65)	_
Hemiptera (66)	_	Salamanders (67)	_
Tricoptera (68)	_	Leeches (69)	_
Coleoptera (70)	_	Other (71)	_

Is other data available: (72) _ Y = Yes, N = No

CARD CODE (1-2) 7 6 Duplicate (3-16)

25. FISH SPECIES:
Enter: A = Abundant, C = Common, U = Uncommon, R = Rare

Dolly Varden (17)	_	Rainbow Trout (18)	_	Dace (19)	_
Kokanee (20)	_	Cutthroat Trout (21)	_	Suckers (22)	_
Grayling (23)	_	Golden Trout (24)	_	Squawfish (25)	_
Whitefish (26)	_	Brown Trout (27)	_	Shiners (28)	_
Yellow Perch (29)	_	Brook Trout (30)	_	Other (31)	_
Sculpins (32)	_	Lake Trout (33)	_	Other (34)	_

26. FISH SIZE: Maximum (35-36) _ _ centimeters, Average (37-38) _ _ centimeters, Minimum (39-40) _ _ centimeters

27. FISH CONDITION: (41) _ E = Excellent, G = Good, F = Fair, P = Poor

28. NATURAL REPRODUCTION: (42) _ Enter appropriate code:

1. Excessive; fish stunting is resulting.
2. Adequate; supplemental stocking is not necessary.
3. Limited; additional stocking is required.
4. None; lake must be restocked if lake is to maintain population.
5. Drift; no reproduction occurs but drift from upper waters is sufficient for stocking.

29. ACCESS (43) _

1. Access is satisfactory for modern car.
2. Access is appropriate for pickup.
3. Access is appropriate for 4-wheel drive.
4. Access trail for horse or foot travel.
5. No trail to area.

30. DISTANCE TO NEAREST ROAD (44-45) _ _ kilometers

31. AREA ADJOINING LAKE SUITABLE FOR RECREATIONAL DEVELOPMENT (46-49) _ _ _ _ hectares

32. AREA OF FORAGE AVAILABLE AND SUITABLE FOR PACK STOCK (50-53) _ _ _ _ hectares

33. LIMITING FACTORS - List a maximum of 10 factors limiting fishery value. Record the most important item first, second most important next, etc. (54-73) _ _, _ _, _ _, _ _, _ _, _ _, _ _, _ _, _ _, _ _

	NATURAL (Physical/Chemical)		NATURAL (Biological)
01	Temperature	11	Overpopulated rough fish
02	Low productivity	12	Overpopulated game fish
03	Spawning area inadequate	13	Unsuitable for game fish
04	Insufficient shoal area	14	Excessive shoreline vegetation
05	Excessive water level fluctuation	15	Excessive aquatic vegetation
06	Oxygen depletion	16	Low aquatic inverts
07	Insufficient depth	17	Excessive mosquitos, etc.
08	Turbidity	18	Understocked
09	Poor esthetics		
10	Avalanche damage		
	MAN-CAUSED		
19	Mining	23	Domestic Stock
20	Logging	24	Excessive water fluctuation
21	Sewage	25	Excessive harvest
22	Excessive siltation	26	Recreational conflicts (boating, etc.)
		27	Overstocked

CARD CODE (1-2) 7 7 Duplicate (3-16)

34. MANAGEMENT NEEDS - List a maximum of 10 needs in order of priority (17-36) _ _, _ _, _ _, _ _, _ _, _ _, _ _, _ _, _ _, _ _

01	Improve road access	13	Aeration needed
02	Improve trail access	14	Control aquatic vegetation
03	Reduce access	15	Change stocking intensity
04	Stabilize water level	16	Fish stocking needed
05	Acquire conservation pool	17	Change fish species
06	Raise water level	18	Control nongame species
07	Dredge to deepen	19	Retain as barren lake
08	Repair dam or dike	20	Fertilize
09	Resolve grazing conflicts	21	Improve spawning area
10	Resolve logging conflicts	22	Reduce fishing intensity
11	Resolve recreation conflicts	23	Encourage additional fishing
12	Pollution abatement needed	24	Improve shoreline
		25	Other

35. DATE OF SURVEY (mo/yr) (37-40) _ _/_ _

36. ARE OTHER COMMENTS OR REMARKS ENTERED BELOW? (41) _ Y=Yes, N=No

_____

_____

_____

37. INVESTIGATOR(S) _____

COMPUTER OUTPUTS

Computer programs will provide output in three areas. They are as follows:

Inventory listing
Summarization reports
Exception reports

Before output programs can be set up, we must know what types of reports or information we want from the computer. It is important that we list each output desired and what data is needed from our inventory to insure that such information is possible. Information coming out can only be a combination or permutation of data going in. The plan now is to begin input phases of GAWS and complete output programs during the years 1976 and 1977. We expect to maintain the output program as we proceed.

Below is a partial list of the output in the areas described above. Under each output there is listed the variables needed to complete the program.

Output Programs

Inventory Listing

The output is a listing of data such as name of stream, catalog number, Forest, State, etc.

Summarization Reports

This output is a summary of various data.

1. Number of streams
2. Miles of stream
3. Miles of stream by gradient type
4. Acres of lakes
5. Numbers of lakes-reservoirs-potholes

Exception Reports

1. Number of miles of stream having a certain species of fish.
2. Number and/or miles of stream or acres of lakes at or above or below a certain elevation.

3. Number and/or miles of stream having a certain percent of a bottom material.

4. Number and acres of lakes, reservoirs, and potholes by maximum depths.

5. Instream flow output - This program will produce the tables, graphs, flow duration curves, solve Mannings formula, etc. Data needed to produce this output is as follows:

a. Gradient

b. Date of sample

c. Stream profile

d. Flow measurements

e. Channel width (bankfull)

f. Water width

g. Bottom material

6. Valley bottom gradient type and stratification - Data Needed:

a. Gradient

b. Location

c. Valley bottom width

d. Beaver activity

e. Geologic class

f. Geologic landform

g. Bottom material by percent

7. Habitat rating - This program would produce the habitat percent of optimum for each station. Data needed:

a. Channel width

b. Pool data

c. Pool rating

d. Feet of gravel and rubble

e. Environmental data

8. Additional desirable programs needing more information.

a. Predicting flow duration curves for non-aged streams.

b. Peak flows and duration for movement of sediment through streams.

c. Habitat types and their relationship to the aquatic resource.

REFERENCES

Arnette, J. L., ____. Nomemclature for instream assessments. Western Water Allocation Office of Biological Services, U.S. Fish and Wildlife Service.

Chrostowski, H. P., 1974. Water quality monitoring and surveillance guidelines. U.S. Forest Service, Intermountain Region, Ogden, Utah.

Collotzi, A. W. and G. Munther, ____. The general aquatic wildlife system. U.S. Forest Service, Intermountain Region, Ogden, Utah.

Dunham, D. K. and A. W. Collotzi, 1975. The transect method of stream habitat inventory. Guidelines and applications. U.S. Forest Service, Intermountain Region, Ogden, Utah.

Mathews, J. E., 1969. Glossary of aquatic ecological terms. USDI, Federal Water Pollution Control Administration, Robert S. Kerr Water Research Center, Ada, Okla 74820.